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Literature Review: The Effect of Tin Leaves (Ficus Carca L.) as an Antibacterial Staphylococcus Aureus

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ABSTRACT
Staphylococcus aureus is a bacteria that causes infections that must be treated with antibiotics. Another alternative that can be done to deal with this resistance is to use herbal ingredients as the basis for therapy. The development of research on natural ingredients as antibacterials shows that there are plants that have the potential to act as antibacterial agents. Fig leaves or figs (Ficus carica L.) are a plant that has the potential to be an antioxidant, antiviral, anthelmintic and antibacterial. Fig leaf extract (Ficus carica L.) shows antibacterial activity against the growth of several bacteria such as Staphylococcus aureus. This literature aims to determine the effect of fig leaves as an antibacterial against Staphylococcus aureus bacteria. This literature uses a literature review method with the Preferred Reporting Items for Systematic Reviews & Meta-Analyses (PRISMA) protocol. Scientific articles or journals downloaded from PubMed, Garuda Portal, and Google Scholar with SINTA accreditation standards in the 2020-2023 time period found 430 articles in the search results. All articles were selected based on the inclusion criteria, resulting in 20 research articles that would be reviewed. The antibacterial potential of fig leaves in the inhibition zone uses ethanol compounds, phenolic flavonoids, ethyl acetate, nickel oxide nanoparticles and Calcium Oxide Phyto-Nanoparticles (CaONPs) which have been proven effective in inhibiting the growth of Staphylococus aureus. Fig leaves are effectively used as an antibacterial for Staphylococcus aureus, showing that they can prevent the growth of bacteria with several compounds contained therein such as Ethanol extract, Phenolic Flavonoids, Ethyl Acetate, Nickel Oxide Nano Particles and Calcium Oxide Phyto-Nanoparticles (CaONPs) which have antibacterial properties.

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INTRODUCTION

The bacteria Staphylococcus aureus (S. aureus) is said to be the most common cause of nosocomial infections, namely infections that patients acquire after being admitted to hospital. Staphylococcus aureus is a gram-positive bacteria and is a pathogen that can cause various infections in humans, such as skin infections. Naturally, Staphylococcus aureus is a

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normal flora in the body, such as on the skin, respiratory tract and digestive tract, but if the population of this bacteria exceeds and exists outside its natural habitat, it will cause infection.

The fig plant has been widely cultivated because it is believed to cure various diseases. In Indonesia itself, fig cultivation is in the Gresik area, East Java, where the leaves of the fig plant are used as tea to treat diabetes. In the development of science, there has been a lot of research on the contents and benefits of fig trees, both leaves, fruit and roots. The nutritional content of figs includes fiber, vitamins A, C, calcium, magnesium and potassium which are really needed by the body. Apart from that, it contains flavonoids, phenolics and several bioactive compounds such as arabinose, β-amyrin, β-carotene, glycosides, β-setosterol and xanthol which are antioxidant compounds. Fig leaf extract (Ficus carica .L) contains active substances such as flavonoids, tannins and terpenoids which are known to have antibacterial potential.

In Qurais Sihab's opinion, the Qur'an is a holy book that contains miracles, because it contains verses that contain scientific signals, which are closely related to the development of scientific methods and the latest discoveries in modern times. According to Quraish Sihab, scientific signals in the Koran do not mean that all scientific theories are contained in the Koran, but what is meant by the Koran containing scientific cues is first, to what extent the content of the verses of the Koran can encourage humans to carry out scientific investigations into second natural phenomenon, there is not a single verse of the Koran that contradicts the evidence of modern scientific discoveries.

Evidence of the scientific indications of the Qur'an can be shown through the command to initiate or carry out empirical investigations and it is found that there is scientific relevance between the verses of the Qur'an and evidence of modern scientific discoveries. This is what has encouraged the emergence of the scientific interpretation method in the study of interpretation, which aims to reveal the mystery of verses that require interpretation through a scientific approach. One of the developments in the field of scientific tafsir is the emergence of tafsir which discusses the benefits of herbal medicines which are linked to the propositions of the Qur'an such as the benefits of honey which is linked to the Qur'an surah An Nahl verses 68-69, the benefits of Tiin fruit and Olives are connected with Surah At Tiin verses 1-2. The proposition of the Koran which contains scientific evidence is also strengthened by the Hadith of the Prophet that the Prophet said.

أ َما َ َدا اللهُ َل َز ْن إ ً ء ِ أ َّل َ ِشفَا لَهُ َل َز ْن ً ء

"Tidaklah Allah menurunkan penyakit kecuali Dia juga menurunkan penawarnya." (HR Bukhari).

Therefore, it is important for the author to carry out scientific studies by connecting the arguments of the Al-Quran with evidence of modern scientific discoveries, including the field that will be discussed in this writing, namely the health sector, considering that one of the characteristics of Islam in the health sector is that it is full of recommendations for maintaining health. , the command to eat halal and good food, and the prohibition on treating an illness with prohibited items. This literature review serves to see the benefits of fig leaves in their antibacterial activity against Staphylococcus aureus.

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METHOD

This research uses a literature review method. Literature was obtained by reviewing scientific articles or journals downloaded from PubMed, Garuda Portal and Google Scholar with the SINTA IV and V standards listed in Figure 1. Articles were screened based on provisions including articles published in 2020-2023, published articles can downloaded in full text and has open access, articles with qualitative, quantitative, mixed method designs and literature reviews that discuss fig leaves or Staphylococcus aureus bacteria. Key words in article searches include Ficus carica, fig leaves, antibacterial, Staphylococcus aureus.

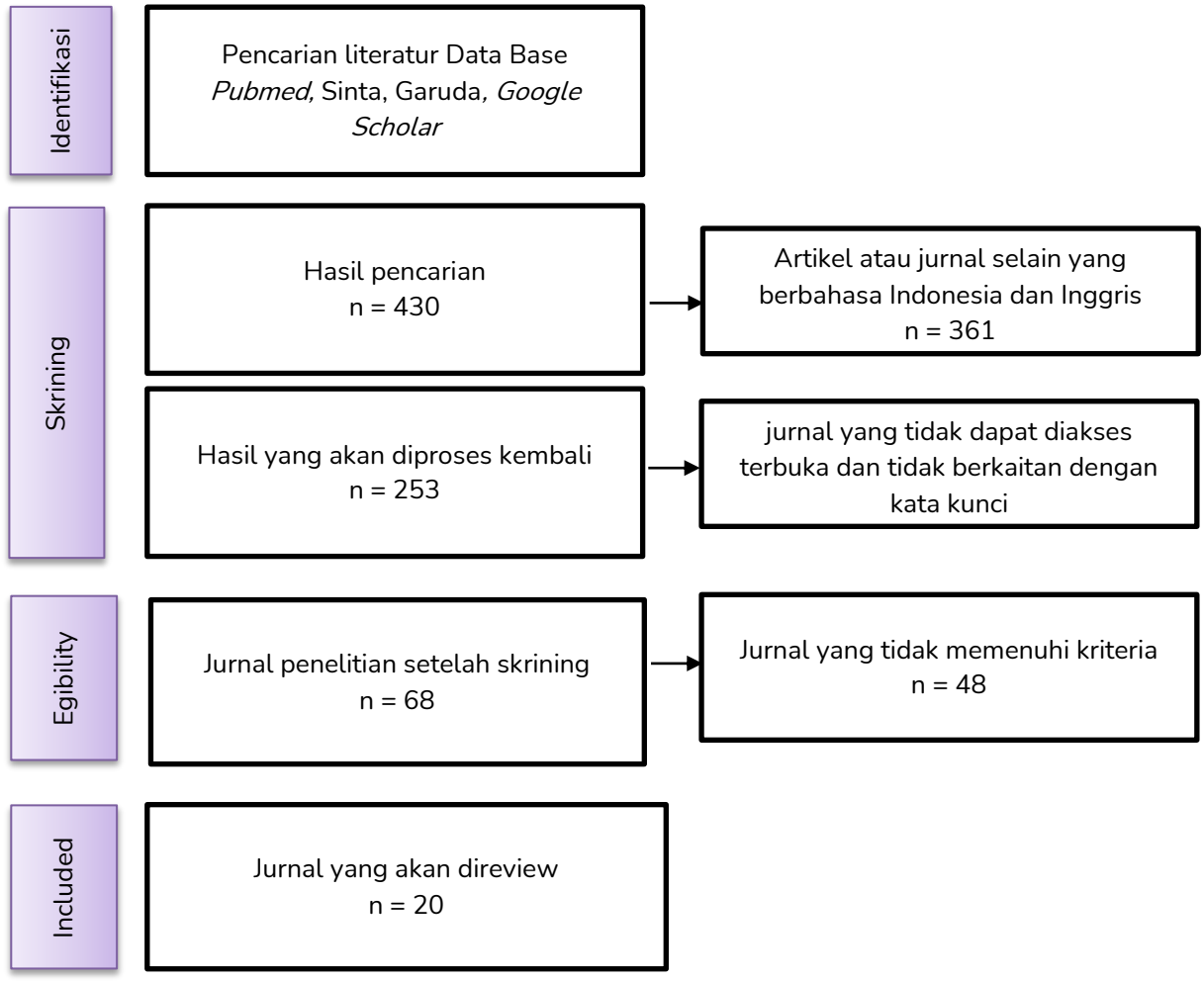

Figure 1. PRISMA Flow of Research Articles on the Effect of Fig Leaves (Ficus Carica L.) as an Antibacterial for Staphylococcus Aureus

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RESULTS AND DISCUSSION

No	Title, Author and Year	Research purposes	Results	Conclusion
1.	The terpenoid content in fig leaves (ficus carica l.) is an antibacterial agent against methicillin-resistant staphylococcus aureus bacteria.Endang Dwi Wulansari *et al* (2020)[2]	This study aims to determine the antibacterial activity of terpenoid content in extracts and fractions of fig leaves (Ficus carica L.) on the growth of Methicillin-Resistant Staphylococcus aureus (MRSA) bacteria using contact bioautography TLC.k.	Tests of the antibacterial activity of hexane (H), ethyl acetate (EA), and ethanol (E) extracts of fig leaves showed that at a concentration of 50% each sample gave an inhibitory zone diameter of 0.111 ± 0.003; 0.328 ± 0.026, and 1.044 ± 0.115 cm, the ethanol extract of fig leaves showed antibacterial activity against one of the oral bacteria, namely Enterococcus faecalis at a concentration of 50%. A concentration of 50% already shows no bacterial growth. Crude ethyl acetate extract from fig leaves has the potential to inhibit the growth of Staphylococcus aureus, better than crude methanol extract.	The terpenoid content in fig leaves (Ficus carica L.) has the potential to act as an antibacterial against the growth of MRSA bacteria, the terpenoid content leads to the triterpenoid form.
2	Minimum inhibitory and killing concentration of fig leaf extract (ficus carica) hydrogel formula against the growth of staphylococcus aureus.Teuku Ahmad Arbi *et al.* (2020)[5]	The aim of this research was to determine the Minimum Inhibitory Concentration (MIC) and Minimum Kill Concentration (KBM) of the tin leaf extract hydrogel formula on the growth of Staphylococcus aureus.	Three test variants for the Minimum Inhibitory Concentration (MIC) and Minimum Kill Concentration (KBM) of the fig leaf extract (Ficus carica) hydrogel formula with concentrations of 5%, 25% and 50%. Minimum Inhibitory Concentration can be determined by looking at the S. aureus test results which are close to the negative control. 30 The research results show that the MIC value is found at a concentration of 5%. Minimum Kill Concentration can be determined by looking at the S. aureus test results which are the same as the positive control. Fig leaf extract (Ficus carica) is able to inhibit the growth of Staphylococcus aureus bacteria at concentrations of 1000 and 2000 µg/ml or the equivalent of 0.1% and 0.2%. The Minimum Kill Concentration cannot be determined	The minimum inhibitory concentration of the fig leaf extract (Ficus carica) hydrogel formula against the growth of Staphylococcus aureus is at a concentration of 5%. The minimum kill concentration of the fig leaf extract (Ficus carica) hydrogel formula against the growth of Staphylococcus aureus was not obtained because the concentration made

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			because more concentration variants are needed to obtain the KBM value in this study.	was less varied.
3.	Antimicrobial, antioxidant, phytochemical and pharmacognostic study of the leaf powder of Ficus carica L.Hussan Ara Begum *et al.* (2020)[6]	This research aims to study macro and microscopic features and screen ethanol extract plants to determine their antioxidant and antimicrobial potential.	The research results revealed that the powdered drug has unicellular and non-separated covering trichomes, parenchymal tissue containing strands of spiral blood vessels, anomocytic stomata and crystalline calcium oxalate. Phytochemically, the extract contains reducing sugars, polysaccharides, oxalic acid, amino acids and protein. The antioxidant activity of the ethanol extract of Ficus carica leaves, using various concentrations (125, 250, 500, 750 and 1000 µg/ml) gave results of 21.42 ± 01, 29.65 ± 03, 53.15 ± 03 57.00 ± 01 and 62.99 ± 05, respectively . The ethanol extract of the leaves used for antibacterial activity had concentrations of 200 and 500 mg/ml, both of which were found to be effective against the selected bacterial strains. K. pneumonia was inhibited by (18 & 28mm), E. coli was found to be (20 & 26 mm) susceptible, Staphylococcus aureus was inhibited by (24 and 26mm) and Pseudomonas aeruginosa was inhibited by (22 and 28mm). It was concluded from this research that the ethanol extract of Ficus carica leaves has good antioxidant constituents and has positive antimicrobial chemical metabolites.	It was concluded that Ficus carica L. has potential metabolites to be used as an alternative to antibacterial and antimicrobial drugs. This plant has many chemical contents which are present in raw form and that is probably the reason why this plant is used locally to treat various diseases in the ethnobotanical domain.
4.	Green Synthesis of Silver Nanoparticles Using the Extraction of some Plants Leaves. Ashwag Al-majrabi *et al.*	this research to investigate antimicrobial activity of Ag NPs synthesized using Ficus carica L (FCL) extract.	The results showed high antimicrobial inhibitory effects of each concentration (100,75,50 and 25)% on Escherichia coli (13nm) and Staphylococcus aureus. (7-9nm) According to zone size, higher antimicrobial inhibitory effect on Escherichia coli more than	These leaves are being proven as reducing and capping agents to reduce silver ions into silver nanoparticles without the

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	(2021)[7]		Staphylococcus aureus	addition of harmful chemicals. Additionally, this study investigates the antimicrobial activity of Ag NPs synthesized using Ficus carica L (FCL).
5.	Bioactive Metabolites of Aspergillus neoniger, an Endophyte of the Medicinal Plant Ficus carica. Randa Abdou *et all.* (2021)[8]	To find out what endophytes are contributed to the reported activity, the bioactive endophyte Aspergillus neoniger was chosen for investigation of its metabolites because it has antimicrobial and anticancer activity at an early stage screening test.	Activity in the agar diffusion test against several tests (Penicillium notatum, Penicillium avelaneum, Aspergillus terreus, Bacillus subtilis, Escherichia coli, Staphylococcus aureus) using nystatin and ciprofloxacin as positive controls for antifungal and antibacterial activity respectively. The results showed that the highest antibacterial and antifungal activities were observed for compounds 2 and 4 while compounds 1 and 3 showed rather weak antimicrobial effects. Additionally, compounds 2 and 4 were examined for antifungal effects against Fusarium oxysporum, a common pathogen of many plants. The results showed MIC values of 67 and 76 µg ml-1 for compounds 2 and 4, respectively. These results indicate the potential protection provided by endophytes to their host plants.	This finding is in agreement with previous studies on this metabolite reporting a lack of selected test strains in agar diffusion assays.
6.	Biomediated synthesis, characterizationand biologica l applications of nickel oxide nanoparticles derived from Toona ciliata, Ficus carica and Pinus roxburghii. Azar Ullah Mirza *et al.*	Studying antibacterial activity against gram-positive and gram-negative bacterial species by agar well diffusion method.	For the antibacterial activity of nickel oxide nanoparticles derived from Ficus carica, both species were sensitive to Gram positive bacteria (10.00 mm) for C. xerosis and (17.33 mm) for B. cereus bacterial strains. S. pyrogenes, S. mutans and S. aureus are resistant species. In the case of Gram negative bacteria, all bacterial species are resistant such as	Nanoparticles made from Pinus roxburghii are more sensitive than F. carica and T. ciliata nanomaterials derived from F. carica and T. ciliata against standard drugs for Gram positive

	(2021)[9]		E.coli, K. pneumonia and P. aeruginosa. Meanwhile, in the case of Ficus carica plant leaf extract, to gram-positive bacteria, S. aureus, S. pyrogenes, C. xerosis and S. epidermis are mildly sensitive bacterial strains while S. mutans and B. cereus are resistant. For gram-positive bacterial strains, E. coli (15.66 mm) and K. pneumonia (10.66 mm) were sensitive bacterial strains.	and Gram negative. Antibacterial research results show that nanomaterials derived from plants have strong antibacterial activity against several clinically isolated bacteria.
7.	Ethnobotanical Study Of Fig Tree (Ficus Carica L.) And Olive (Olea Europaea L.) From Tetouan Province In Morocco And Study Their Antimicrobial Activity Zakaria *et al.* (2021)[10]	This research has conducted an ethnobotanical and antimicrobial activity survey in the province of Tetouan, Morocco to identify the use of well-known plant species in traditional medicine: fig and olive trees and follow-up antimicrobial activity over three stages for green, pink and black olives and blending activity olive and fig extract.	The results of the antibacterial activity of the water extract and ethanolic extract of O. europaea leaves and Ficus carica leaves are presented in that the ethanolic extract and water extract of olive leaves from the Tetouan area are the most active against all bacteria tested with a maximum inhibition zone against P. aeruginosa (25 mm) and (23mm) respectively while it is also Active against P. aeruginosa the minimum inhibition zone is against E. coli (11mm and 14 mm respectively). Staphylococcus aureus 23 mm and Pseudomonas aeruginosa (PA) 12mm, Antimicrobial activity results showed that the ethanol extract showed good inhibitory effects against most bacterial and yeast strains. Also for the majority of the strains tested, it was found that in December (black olive), the activity was stronger, and that the mixture of olive ethanol extract with fig tree ethanol extract and Ficus Carica leaf water extract mixture.	Ethnobotanical studies of fig and olive trees, at various sites in the Tangier-Tetouan-ElHoceima region in Morocco, have gathered information about the various uses in traditional medicine of these two plants, fig trees have been used to treat asthma, colds, coughs, constipation and warts. As for the olive tree, most of the farmers use olive oil to treat diseases of the respiratory system, digestive system, nervous system and get rid of constipation, ear infections and others. Also for most of the tested

				strains, it was found that in December (black olives), the activity was stronger, and that the mixture of olive extract with fig tree extract strengthened it 16.5mm).
8.	Antimicrobial Effect of Ficus carica on Nosocomial Bacterial Infections. Syahada Jabbari *et al* (2021)[11]	This research aims to evaluate antimicrobial activity of Ficus carica extract against pathogenic bacteria, especially nosocomial infections.	The aqueous extract of the plant showed a higher inhibitory effect against microbial strains compared to the alcoholic extract. The two strains S. saprophyticus and S. aureus showed greater susceptibility than extracts (e.g., water, methanol, and ethanol). Statistically, there was a significant difference in the minimum inhibitory concentration for growth of the aqueous extract compared to the alcoholic extract. The water extract has a minimum inhibitory concentration of 133 mg/mL and a minimum bactericidal concentration of 200 mg/mL on gram-positive bacteria S. saprophyticus and S. aureus.	This study found that F. carica extract had a significant effect on the microorganisms of two gram-positive bacteria including S. saprophyticus (diameter 62 mm) and S. aureus (diameter 60 mm), and P. aeruginosa bacteria showed the highest resistance to gram-negative bacteria . The extract also showed a significant effect compared to antibiotics as a control. Although further research is Although further research is needed in this regard, F. carica extract can be suggested as a new antimicrobial agent in medical research.

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9.	A comprehensive review on phytochemistry, bioactivities, toxicity studies, and clinical studies on Ficus carica Linn. Leaves. Zhongyuan Li *et al.* (2021)[12]	This review serves as a comprehensive resource for those interested in understanding the scientific evidence supporting the medicinal value of FC leaves as well as the research gaps to further increase the commercial value and health benefits of FC leaves.	The methanol extract of the leaves showed antibacterial activity against Staphylococcus aureus, Staphylococcus epidermidis, and Streptococcus pyogenes with minimum inhibitory concentration ranges: 125-250, 31.25-62.5, and 62.5-125 µg/mL, respectively. β-caryophyllene, one of the volatile constituents, showed selective antibacterial activity against Staphylococcus aureus (minimum inhibitory concentration, 3 ± 1.0 µM). Dichloromethane leaf extract reportedly inhibits quorum sensing activity among bacteria and thereby prevents adaptation of the bacteria to the environment.	it is stated that Ficus Carica leaves have moderate toxicity however scientific research has proven the toxicity of Ficus Carica leaves to be far above the usual dose and thus precautions must be taken regarding the amount of Ficus Carica leaves consumed. Ficus Carica leaves also have renoprotective and hepatoprotective activity at doses much lower than toxic doses. In addition, scientific investigations have confirmed that topical application of Ficus Carica leaves causes phototoxicity and furocoumarins, such as psoralen, were found to be responsible for phototoxicity.
10.	Antibacterial and Antifungal Activity of Ficus carica Plant Extract. Firza Shafique *et al.* (2021)[13]	In developing countries, many expensive synthetic drugs are used to cure diseases but but it has many side	Ficus Carica which has good activity against gram-positive bacteria, gram-negative bacteria and fungal species. Methanol and chloroform extracts from roots, stems, leaves and fruit were prepared and the zones of inhibition were measured using the well diffusion	Different parts of the ficus carica plant were used to investigate the antimicrobial and antifungal activity of the

		effects. Therefore, there is a need to develop new strategies to control microbes infection.	method against gram-negative bacteria (Escherichia coli, Pseudomonas aeruginosa), two gram-positive bacteria (Staphylococcus aureus, Bacillus cereus) and two species of Aspergillus fungi niger and Aspergillus oryzae. Leaf methanol extract has a high yield (5.86%) and a high zone of inhibition (23 mm) against Escherichia coli bacteria and the fungus Aspergillus niger (34 mm). Staphylococcus aureus bacteria are very sensitive to chloroform extract with an inhibition zone of 74 mm, while Escherichia coli is very sensitive to metabolic extracts with an inhibition zone of 82 mm. Chloroform extract has an average inhibition zone (56mm) and methanol extract has an average inhibition zone (63mm).	antimicrobial and antifungal activity against two gram-positive bacteria, two gram-negative bacteria and two fungal species and concluded that high potency was observed in the menthanol extract of the leaves against the gram-negative bacteria Escherichia coli with zona inhibition 23m and the fungus Aspergillus niger with an inhibition zone of 34mm. Therefore, the Ficus Carica plant can be used to treat bacterial and fungal infections, especially the leaves have high antimicrobial and antifungal activity.
11.	Formulation and testing of the antibacterial effectiveness of fig leaf (ficus carica l.) ethanol extract cream against staphylococcus aures bacteria that cause skin infections.Putri Margaretha	This research aims to find an appropriate cream formulation based on natural ingredients and develop a fig leaf extract which has been analyzed for its benefits as an antibacterial which inhibits	fig leaf extract (Ficus carica L.) with a concentration of 15% has a larger diameter of the inhibition zone against Staphylococcus aureus bacteria with an average diameter of 10 cm on each bacterial medium.	Fig leaf extract cream (Ficus carica L.) with a concentration of 15% has a soft texture even if stored at room temperature, hot or cold temperatures, the pH of the fig leaf extract cream preparation (Ficus

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	Glaudy Pani *et al.* (2022)[1]	the growth of Staphylococcus aures bacteria in the form of a cream dosage making it easier to use.		carica L.) is in accordance with the pH of the skin (Ph = 6) so that it can be applied to the skin, the spreadability of the preparation is better compared to other concentrations, namely 250 grams free with a diameter of 6 cm, and good adhesion, namely 5 seconds.
12.	Test of the Antibacterial Activity of Fig Leaf Extract (Ficus Carica L.) Against Escherichia Coli and Staphylococcus Aureus Bacteria.Muhammad Iqbal Farhan *et al.* (2022)[3]	The aim of this research is to determine whether fig leaf extract is effective as an antibacterial against Escherichia coli and Staphylococcus aureus bacteria and to determine the concentration of fig leaf extract as an antibacterial. Fig leaf extraction method using percolation method using ethanol solvent and testing the antibacterial activity of fig leaf extract against Escherichia coli and Staphylococcus	The research results showed that the test concentrations used were 20%, 30%, 40% and 50% had antibacterial activity against Escherichia coli bacteria and the research results showed that the test concentrations used were 5%, 10%, 20%, 30%, 40% and 50% has antibacterial activity against Staphylococcus aureus bacteria. In Escherichia coli bacteria the inhibitory concentration occurs at a concentration of 20% with an inhibitory diameter of 10.50 mm, while in Staphylococcus aureus bacteria the inhibitory concentration occurs at a concentration of 5% with an inhibitory diameter of 1.30 mm, from this concentration the Escherichia coli bacteria meet the strong category. (10-20 mm) and Staphylococcus aureus bacteria and fulfill the weak category (< 5 mm).	From the research results, it was concluded that fig leaves (Ficus carica L.) can inhibit the growth of Escherichia coli and Staphylococcus aureus bacteria. Fig leaf extract (Ficus carica L.) has antibacterial activity against Escherichia coli at a concentration of 20% with an obstacle diameter of 10.50 mm in the strong category (10-20 mm) and Staphylococcus aureus at a concentration of 5% with an obstacle diameter of

		aureus bacteria.		1.30 mm. and meets the weak category (< 5 mm).
13.	Assessment of flavonoid-rich extracts from dark peels of Ficus carica L. fruits for cosmeceutical and antimicrobial applications. Leila Meziant *et al.* (2022)[14]	Testing the antimicrobial activity of the extract was evaluated by agar well diffusion test followed by minimal inhibitory concentration determination using the microdilution method against Gram-positive and Gram-negative pathogenic bacteria and two fungi.	Fig leaf extract contains high amounts of phenolic compounds (3.85-8.63 g/100 g), especially flavonoids (up to 5 g/100 g). Some antibacterial activity was noted against Gram-positive and Gram-negative Bacteria, with the best action against Bacillus subtilis (minimum inhibitory concentration = 156.25 µg/mL), Staphylococcus aureus and Pseudomonas aeruginosa (minimum inhibitory concentration = 312.5 µg/mL) , but no antifungal activity was noted.	Therefore, Ficus carica L. bark extract can be considered as a natural ingredient with potential applications in antibacterial drug formulations and skin care.
14.	Screening Of Antimicrobial Capacity Of Fruit And Leaf Extracts In Ficus Carica L. By Plates And Wells Method. Olga Sofía Brunal-Albonis *et al* (2022)[15]	The aim was to see the antimicrobial capacity of F. carica L. fruit and leaf extracts evaluated using plate and well method,	The results show the values obtained for the fruit and leaf extracts of Ficus carica L and their fractions against Staphylococcus aureus. The water fraction, both fruit and leaves, at 100 mg/mL was the highest concentration with antimicrobial activity against microorganisms with an inhibition percentage of 124% and 139.6%. Dichloromethane leaves and petroleum ether fractions did not show antimicrobial activity at 50 mg/mL.	It can be concluded that the fruit and leaf extracts and fractions of Ficus carica L. show antimicrobial activity against bacterial and fungal microorganisms. The water fraction, both from fruit and leaves, has the highest antimicrobial activity against bacteria at a concentration of 100 mg/mL, followed by the ethanolic extract at the same concentration. Antimicrobial activity varies

				against fungal microorganisms; however, dichloromethane leaf dichloromethane fraction showed the highest inhibition against yeast and filamentous fungi at concentrations of 25 mg/mL and 100 mg/mL and 100 mg/mL, respectively
15.	Potential of Fig Leaf Extract (Ficus carica L.) as an antibacterial.Syavina Nur Zahira *et al.* (2023)[16]	This research aims to determine the antibacterial activity of fig leaf extract against E.coli and S.aureus bacteria, as well as to determine the compounds contained in fig leaf extract that have antibacterial potential.	The results of fig leaf extract have better antibacterial activity against S. aureus which is a gram-positive bacteria. This can be seen from the diameter of the inhibition zone formed. In addition, fig leaf n-hexane extract has better antibacterial activity than ethyl acetate extract and ethanol extract because at a concentration of 0.2% fig leaf n-hexane extract can inhibit E.coli and S.aureus bacteria with respective inhibition zone diameters. - respectively 9 mm (medium) and 12 mm (strong).	Based on the results of the literature study in this research, the author concluded that fig leaf extract has better antibacterial activity in inhibiting gram-positive bacteria such as S.aureus.
16.	Antibacterial and Antibiofilm Activity of Ficus carica-Mediated Calcium Oxide (CaONPs) Phyto-Nanoparticles, Asif Ullah Khan *et al.* (2023)[17]	In this research, calcium oxide biosynthesis was carried out nanoparticles (CaONP) using green chemistry strategies and utilizing extracts Ficus carica for	Results of the use of Ficus carica L extract as a capping and reducing agent in phyto-mediated synthesis of CaONPs for evaluation of their antimicrobial properties. NPs-mediated phytosynthesis is considered a reliable approach due to its high yield, stability, non-toxicity, cost-effectiveness and environmental friendliness. CaONPs were physiochemically characterized by UV-visible	It was concluded that this easy environmentally friendly product was able to synthesize stable and effective CaONPs. The therapeutic value of CaONPs is demonstrated by their potential as

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		antimicrobial recently due to the alarming increase in antibiotic resistance.	spectroscopy, energy dispersive X-ray (EDX), scanning electron microscopy (SEM), X-ray diffraction (XRD), and Fourier transform infrared spectroscopy (FTIR). The biological synthesis of calcium oxide nanoparticles shows a characteristic surface plasmon resonance (SPR) peak at 360 nm in UV-Vis spectroscopy, which clearly reveals the successful reduction of Ca2+ ions to Ca0 nanoparticles. The characteristic FTIR peak seen at 767 cm-1 corresponds to the stretching of Ca-O bonds and, thus, confirms CaONP biosynthesis, while scanning electron micrographs reveal near-CaO aggregates with an average diameter of 84.87 ± 2.0 nm. Antibacterial and anti-biofilm analysis of CaONP showed bacterial inhibition in the following order: P. aeruginosa (28 ± 1.0) > S. aureus (23 ± 0.3) > K. pneumoniae (18 ± 0.9) > P vulgaris (13 ± 1.6) > E. coli (11 ± 0.5) mm. CaONPs were shown to strongly inhibit biofilm formation, providing strong evidence for their primary antibacterial activity.	antibacterial and antibiofilm agents in future treatments.
17.	Antimicrobial properties and biotransforming ability of fungal endophytes from Ficus carica L. (Moraceae). Melisa Isabel Barolo *et al.* (2023)[18]	To identify antibacterial and antifungal activity using molecular methods against fifteen fungal isolates associated with Ficus Carica leaves.	Antibacterial screening of EtOAc extracts from endophytic fungi carried out by agar spot bioautography showed that four extracts (F8, F10, F13 and F14) inhibited S. aureus at 25 µg/spot with zones of inhibition ranging from 11.0 mm to 2.0 mm in bioautography tests. E. nigrum F10 extract showed activity against E. coli at 25 µg/spot with an inhibition zone of 11.0 mm	Our research results confirm that Ficus carica L can live in symbiosis with a rich and diverse endophyte community, thus adding insight into ecology.
18.	Evaluation of a Fish Gelatin-	This research aims to	This edible film is produced by adding Ficus carica L	Overall research findings

	Based Edible Film Incorporated with Ficus carica L. Leaf Extract as Active Packaging. Hanan Rizqy Fauzan *et al.* (2023)[19]	develop edible films using Ficus carica L. (FLE) leaf extract, because it is affordable, easy to obtain, and has superoxide anion radicals superoxide anion radical.	leaf extract to mackerel fish skin gelatin with varying concentrations (2.5-10% w/w). The results showed that the addition of Ficus carica L leaf extract to gelatin films significantly influenced tensile strength, elongation at break, transmittance and transparency, solubility, water vapor permeability, antioxidant activity, and antibacterial activity. Among all samples, the most promising results were obtained for edible films with 10% Ficus carica L leaf extract, resulting in tensile strength, elongation at break, solubility, water vapor permeability, antioxidant activity, and antibacterial activity against S. aureus and E. coli at 2.74 MPa, 372.82%, 36.20%, 3.96 × 10-11 g/msPa, 45.49%, 27.27 mm, and 25.10 mm, respectively .	show that fish gelatin-based film combined with Ficus carica L leaf extract is an active packaging material that is environmentally friendly, biodegradable and sustainable.
19.	The Effects of Alcoholic Extract of Ficus carica Leaves on Some Chemical and Microbiological Properties of Beef during Refrigerated Storage. Naeam Haider *et al.* (2023)[20]	This study explored the preservation effect of alcoholic leaf extract from Ficus carica on beef refrigerated for 15 days.	Phytochemical analysis shows that plant extracts contain terpenoids, flavonoids, tannins, saponins and alkaloids. In addition, the alcoholic extract of the plant significantly reduced the total number of psychrotrophic bacteria, pathogenic bacteria (Proteus, Salmonella typhimiurum, Escherichia coli, and Staphylococcus aureus), and yeast (Candida kruse, Candida lambica, and Zygosaccharomyces) isolated from meat samples, especially in concentrations of 100 and 200 mg/ml. The antioxidant activity of the extract was determined using TBA and TVN values. The results showed that meat samples treated with 100 and 200 mg/ml of F. carica alcohol extract had significantly lower TBA values (25, 0.24 mg/kg respectively) on day 5 which	All research results confirm that the alcoholic extract of F. carica, which is rich in bioactive compounds, is more effective as an antibacterial, antifungal and antioxidant, compared to synthetic antioxidants which maintains the quality of beef, compared to controls by reducing lipid oxidation and microbial growth at cooling temperatures, especially at concentrations of 100 and

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			was 0.92 and 0.53 mg/kg on day 15. Meanwhile, the control value increased from 0.25 to 1.75 mg/kg on day 15, followed by the TVN value from meat samples treated with 100 and 200 mg/ml of 5.57, 5.12 mg N/100 g of meat. respectively on day 5 which became 12.16, 10.65 mg N/100 g meat on day 15, while TVN in control samples increased significantly ($p < 0.05$) from 7.35 to 15 .76 mg N/100 g meat.	200 mg/ml plant extract.
20.	The Natural Ficus carica L. (fig) Extract as an Effective Prophylactic Antibacterial Agent for Inflammation Related Infections (2023)[21]	The aim of this study was to analyze the antibacterial and antioxidant effects of Ficus carica L. (fig) branch extract and to conduct in vivo animal experiments to better understand the mechanism of antibacterial absorption antibacterial components during digestion after oral administration.	With fig leaf extract obtained from fractional distillation for 35 minutes, antibacterial pathogen tests were carried out against K. pneumoniae, E. coli, S. aureus, and P. aeruginosa using the paper disc method. Fig branch extract (35 minutes of fractional distillation time) showed an effective inhibitory area against K. pneumoniae (24.5 ± 1 mm), E. coli (15.5 ± 0.75 mm), S. aureus (17 ± 0 .5 mm), and P. aeruginosa (8.25 ± 0.38 mm). Interestingly, this extract offers the most effective antibacterial effect against K. pneumoniae, which is an inflammation-inducing bacteria. These findings suggest that fig branch extract offers better antibacterial properties than other alternatives, especially against inflammatory bacteria.	Extraction concentrations are not explicitly specified in the literature, making direct comparison difficult. The antibacterial effect may have been increased because the longer the extraction time, the higher the content of antibacterial phenolic compounds in the fig branch extract. However, when the fractional distillation time exceeds 35 minutes, the antibacterial effect does not increase further because the concentration

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Discussion

The fig plant, also known as fig, is known by the public as a useful medicinal plant. Both the leaves and fruit of the fig plant contain many secondary metabolic compounds that are good for health. According to research, fig leaf extract (Ficus carica L.) shows antibacterial activity against the growth of several bacteria such as Streptococcus mutans, Streptococcus sanguinis, Streptococcus sobrinus, Streptococcus ratti, Streptococcus criceti, Streptococcus anginosus, Streptococcus gordonii, Aggregatibacter actinomycetemcomitans, Fusobacterium nucleatum, Prevotella intermedia, Porphyromonas gingivalis and the bacteria Staphylococcus aureus, Bacellus cereus, Klebsiella pneumonae, Pseudomonas aeruginosa, Salmonella typhi, and Escherichia coli.

Fig leaf or fig leaf extract shows antibacterial activity on several bacteria, one of which is Staphylococcus aureus. Fig leaf extract itself has potential as an antibacterial agent because it contains polyphenols and flavonoids in the chemical composition of fig leaf extract. Apart from these two contents, the terpenoid content in fig leaf extract has also been proven to have antibacterial potential against the growth of Staphylacoccus aureus bacteria. The results of studies that have been carried out show that ethanol extract from fig leaves (Ficus carica L.). Based on the results above, several compounds in fig leaves were found to have an effect as antibacterial agents:

Etanol

The antioxidant activity of the ethanol extract of Ficus carica leaves, using various concentrations (125, 250, 500, 750 and 1000 µg/ml) gave results of 21.42 ± 01, 29.65 ± 03, 53.15 ± 03 57.00 ± 01 and 62.99 ± 05, respectively . The ethanol extract of the leaves used for antibacterial activity had concentrations of 200 and 500 mg/ml, both of which were found to be effective against the selected bacterial strains. K. pneumonia was inhibited by (18 & 28mm), E. coli was found to be (20 & 26 mm) susceptible, Staphylococcus aureus was inhibited by (24 and 26mm) and Pseudomonas aeruginosa was inhibited by (22 and 28mm). It was concluded from this research that the ethanol extract of Ficus carica leaves has good antioxidant constituents and has positive antimicrobial chemical metabolites.

The results show the values obtained for the fruit and leaf extracts of Ficus carica L and their fractions against Staphylococcus aureus. The water fraction, both fruit and leaves, at 100 mg/mL was the highest concentration with antimicrobial activity against microorganisms with an inhibition percentage of 124% and 139.6%. Dichloromethane leaves and petroleum ether fractions did not show antimicrobial activity at 50 mg/mL.

Fenolik Flavonoid

Phytochemical analysis shows that plant extracts contain terpenoids, flavonoids, tannins, saponins and alkaloids. In addition, the alcoholic extract of the plant significantly reduced the total number of psychrotrophic bacteria, pathogenic bacteria (Proteus, Salmonella typhimiurum, Escherichia coli, and Staphylococcus aureus), and yeast (Candida kruse, Candida lambica, and Zygosaccharomyces) isolated from meat samples, especially in concentrations of 100 and 200 mg/ml.

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Etil asetat

The antibacterial activity of hexane (H), ethyl acetate (EA), and ethanol (E) extracts of fig leaves shows that at a concentration of 50% each sample provides an inhibitory zone diameter of 0.111 ± 0.003; 0.328 ± 0.026, and 1.044 ± 0.115 cm, the ethanol extract of fig leaves showed antibacterial activity against one of the oral bacteria, namely Enterococcus faecalis at a concentration of 50%. A concentration of 50% already shows no bacterial growth. Crude ethyl acetate extract from fig leaves has the potential to inhibit the growth of Staphylococcus aureus, better than crude methanol extract.

Nano Partikel Nikel Oksida

The antibacterial activity of nickel oxide nanoparticles derived from Ficus carica, both species are sensitive to Gram positive bacteria (10.00 mm) for C. xerosis and (17.33 mm) for B. cereus bacterial strains. S. pyrogenes, S. mutans and S. aureus are resistant species. In the case of Gram negative bacteria, all bacterial species are resistant such as E.coli, K. pneumonia and P. aeruginosa. Meanwhile, in the case of Ficus carica plant leaf extract, to gram-positive bacteria, S. aureus, S. pyrogenes, C. xerosis and S. epidermis are mildly sensitive bacterial strains while S. mutans and B. cereus are resistant. For gram-positive bacterial strains, E. coli (15.66 mm) and K. pneumonia (10.66 mm) are sensitive bacterial strains.

Calcium Oxide Phyto-Nanoparticles(CaONPs)

Use of Ficus carica L extract as masking and reducing agent in phyto-mediated synthesis of CaONPs for evaluation of their antimicrobial properties. NPs-mediated phytosynthesis is considered a reliable approach due to its high yield, stability, non-toxicity, cost-effectiveness and environmental friendliness. CaONPs were physiochemically characterized by UV-visible spectroscopy, energy dispersive X-ray (EDX), scanning electron microscopy (SEM), X-ray diffraction (XRD), and Fourier transform infrared spectroscopy (FTIR). The biological synthesis of calcium oxide nanoparticles shows a characteristic surface plasmon resonance (SPR) peak at 360 nm in UV-Vis spectroscopy, which clearly reveals the successful reduction of Ca2+ ions to Ca0 nanoparticles. The characteristic FTIR peak seen at 767 cm-1 corresponds to the stretching of Ca-O bonds and, thus, confirms CaONP biosynthesis, while scanning electron micrographs reveal near-CaO aggregates with an average diameter of 84.87 ± 2.0 nm. Antibacterial and anti-biofilm analysis of CaONP showed bacterial inhibition in the following order: P. aeruginosa (28 ± 1.0) > S.

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aureus (23 ± 0.3) > K. pneumoniae (18 ± 0.9) > P vulgaris (13 ± 1.6) > E. coli (11 ± 0.5) mm. CaONPs were shown to strongly inhibit biofilm formation, providing strong evidence for their primary antibacterial activity.

CONCLUSION

Based on the results of identification and several studies in this literature review, it can be concluded that fig leaves are effectively used as an antibacterial for Staphylococcus aureus, with research results showing that they can prevent bacterial growth with several compounds contained therein such as ethanol extract, phenolic flavonoids, ethyl acetate, nano particles. nickel oxide and Calcium Oxide Phyto-Nanoparticles (CaONPs) which have antibacterial properties so this could be a recommendation for colleagues to consider fig leaves as disease prevention and treatment for bacterial infections.

REFERENCES

1. Mei VN. PHARMACON – PROGRAM STUDI FARMASI , FMIPA , UNIVERSITAS SAM RATULANGI , Volume 11 Nomor 2 Mei 2022 FORMULATION AND EFFECTIVENESS TESTING OF ANTIBACTERIAL CREAM OF FIG LEAF (Ficus Carica L .) ETHANOL EXTRACT AGAINST Staphylococcus aures BACTERIA CAUSES SK. 2022;11:1438-1444.
2. Ratulangi USAM. PHARMACON – PROGRAM STUDI FARMASI, FMIPA, UNIVERSITAS SAM RATULANGI, Volume 9 Nomor 2 Mei 2020. 2020;9:219-225.
3. Farhan MI, Chusniasih D, Marcellia S. ANTIBACTERIAL ACTIVITY TESTING OF FINE (Ficus carica L .) LEAF EXTRACT AGAINST Escherichia coli and Staphylococcus aureus UJI AKTIVITAS ANTIBAKTERI EKSTRAK DAUN TIN (Ficus carica L .) TERHADAP BAKTERI Escherichia coli dan Staphylococcus aureus. 2022;11:1328-1334.
4. Nugraha WF, Mulyani T. Wahyu Fajar Nugraha, Tri Mulyani 2020. *Etnofarmakologi Tanam Tin (Ficus carica L) (Kajian Tafsir Ilmu Tentang Buah Tin Dalam Al- Quran)*. 2020;VII(1):58-65. https://www.google.com/url?sa=t&source=web&rct=j&url=https://ejournals.stfm.ac.id/index.php/JurnalFarmagazine/article/download/156/pdf&ved=2ahUKEwid0f_cnvX6AhXvALcAHWNMARoQFnoECA0QAQ&usg=AOvVaw1uP4YotQnwZKqCYdsJ7tSd
5. Dent C. Cakradonya Dent J; 13(1): 22-31. 13(1):22-31.
6. Begum HA. Antimicrobial, antioxidant, phytochemical and pharmacognostic study of the leaf powder of Ficus carica L. *Pure Appl Biol*. 2020;9(1):999-1008. doi:10.19045/bspab.2020.90105
7. Al-Jawani AAM& SAJ& H, Al-samawey BR& MA jawani & A, F.Yehya AA&. Green Synthesisof Silver Nanoparticles Using the Extraction of some Plants Leaves. *Albaydha Univ J*. 2021;2(3):177-185. doi:10.56807/buj.v2i3.110
8. Abdou R, Alqahtani AM, Attia GH. Bioactive Metabolites of Aspergillus neoniger, an Endophyte of the Medicinal Plant Ficus carica. *Indian J Pharm Sci*. 2021;83(1):101-109. doi:10.36468/pharmaceutical-sciences.755
9. Mirza AU, Khan MS, Kareem A, et al. Biomediated synthesis, characterization, and

biological applications of nickel oxide nanoparticles derived from Toona ciliata, Ficus carica and Pinus roxburghii. *Bioprocess Biosyst Eng*. 2021;44(7):1461-1476. doi:10.1007/s00449-021-02528-4

10. Mennane Z, Tabet Z, El kharraz B, et al. Ethnobotanical Study Of Fig Tree (Ficus Carica L.) And Olive (Olea Europaea L.) From Tetouan Province In Morocco And Study Their Antimicrobial Activity. *E3S Web Conf*. 2021;319:1-5. doi:10.1051/e3sconf/202131901091
11. Jabbari S, Mirbagheri Firoozabad MS. Antimicrobial Effect of Ficus carica on Nosocomial Bacterial Infections. *Avicenna J Pharm Res*. 2021;2(2):73-78. doi:10.34172/ajpr.2021.14
12. Li Z, Yang Y, Liu M, et al. A comprehensive review on phytochemistry, bioactivities, toxicity studies, and clinical studies on Ficus carica Linn. leaves. *Biomed Pharmacother*. 2021;137(February):111393. doi:10.1016/j.biopha.2021.111393
13. Shafique F, Naureen U, Zikrea A, et al. Antibacterial and Antifungal Activity of Ficus carica Plant Extract. *J Pharm Res Int*. 2021;33(18):1-9. doi:10.9734/jpri/2021/v33i1831311
14. Meziant L, Bachir-Bey M, Boutiche M, Gali L, Ikhlef A, Louaileche H. Assessment of flavonoid-rich extracts from dark peels of Ficus carica L. fruits for cosmeceutical and antimicrobial applications. *Tradit Med Res*. 2022;7(6):52. doi:10.53388/tmr20220313002
15. Brunal-albonis OS, Arias-palacios J, Rodríguez-aguirre ÓE. SCREENING OF ANTIMICROBIAL CAPACITY OF FRUIT AND LEAF EXTRACTS IN FICUS CARICA L . BY PLATES AND WELLS METHOD PhOL Introduction. Published online 2022:13-20.
16. Nur Zahira S, Aryani R, Prabowo Soewondo B. Potensi Ekstrak Daun Tin (Ficus carica L.) Sebagai Antibakteri. *Bandung Conf Ser Pharm*. Published online 2023:506-513. doi:10.29313/bcsp.v3i2.8932
17. Khan AU, Hussain T, Abdullah, et al. Antibacterial and Antibiofilm Activity of Ficus carica-Mediated Calcium Oxide (CaONPs) Phyto-Nanoparticles. *Molecules*. 2023;28(14):1-13. doi:10.3390/molecules28145553
18. Barolo MI, Castelli MV, López SN. Antimicrobial properties and biotransforming ability of fungal endophytes from Ficus carica L. (Moraceae). *Mycology*. 2023;14(2):108-132. doi:10.1080/21501203.2023.2175500
19. Fauzan HR, Ningrum A, Supriyadi S. Evaluation of a Fish Gelatin-Based Edible Film Incorporated with Ficus carica L. Leaf Extract as Active Packaging. *Gels*. 2023;9(11). doi:10.3390/gels9110918
20. Haider N, Rafi Z, Hussein RA, Emad B. The Effects of Alcoholic Extract of Ficus carica Leaves on Some Chemical and Microbiological Properties of Beef during Refrigerated Storage. *Iraqi J Sci*. 2023;64(11):5541-5553. doi:10.24996/ijs.2023.64.11.7
21. Kim J, Lee D. The Natural Ficus carica L . (fig) Extract as an Effective Prophylactic Antibacterial Agent for Inflammation- Related Infections. Published online 2023.